Feeding the Mars Colony

Group Assignment (up to 4 people)

Use ecosystem trophic structure principles to design a food production module for a Mars colony of 10 people. Your module is 10,000 m^2 (100 m x 100 m) with a domed ceiling ~20 m at its peak height. You will need both calorie sources and protein sources. Be creative and use diagrams to help you determine space needs as well as trophic structure.

Food supply: you need at least two main plant food sources and at least one main protein source. You may combine ideas or stick to one single food production method.

* Assumptions
  + People need about 2000 kcal per day.
  + Your grow lights provide enough light to make growing conditions similar to Earth
  + You can chemically generate enough water to start and maintain aquaculture as well as use condensation to recycle water vapor
  + Food waste will be composted and returned to the growing media
* Think outside of the box:
  + Think about ways to increase the amount of growing surface you have.
  + How might you combine growing areas?
* Hints and ideas:
  + 1 cup of corn = 125 kcal, 1 Potato = 100 kcal, 1 Apple = 80 kcal, 1 cup of Rice = 300 kcal
  + Detritovores (like shrimp [7 kcal each] or some catfish [~300 kcal each] can be a space efficient protein sources).
  + Tilapia = ~200 kcal each
  + Filter feeders like oysters (50 kcal each) could also be efficient food sources
  + Honey = 1,031 kcal per cup
  + Frog legs = 20.4 kcal each
* Thought questions:
  + What conditions or inputs will be needed to assure long term sustainability of your food source?
  + What appears to be the most challenging aspect of this task?